

In the Claims:

Please cancel claims 6 and 13 without prejudice, and amend claims 1, 3, 7, 8-10, 15 and 16. The status of all claims is as follows:

1. (Currently Amended) A magnetic recording medium comprising:
  - a substrate;
  - a magnetic layer, including a CoCr-based alloy and nonmagnetic elements other than Cr, and having a multi-layer structure and disposed above said substrate,
  - said multi-layer structure having a first magnetic layer disposed above said substrate and at least one second magnetic layer disposed directly on said first magnetic layer on an opposite side from said substrate;
  - a first underlayer including a Cr-based alloy and disposed on said substrate; and
  - a second underlayer including a Cr-based alloy and disposed between said first underlayer and said first magnetic layer, said second underlayer including at least one element selected from a group consisting of Mo, W, V and Ta; and
  - an intermediate layer made of a Co-based alloy and disposed between said second underlayer and said first magnetic layer,
  - said first magnetic layer having a Cr-content larger than that of said second magnetic layer,

said first magnetic layer having a larger sum total content of nonmagnetic elements which are other than Cr and which nonmagnetic elements have a larger atomic radius than Co compared to said second magnetic layer,

said second underlayer having a larger sum total content of elements, other than Cr, than said first underlayer.

2. (Previously Presented) The magnetic recording medium as claimed in claim 1, wherein said first and second magnetic layers include at least one nonmagnetic element selected from a group consisting of Pt, Ta, W and B.

3. (Currently Amended) ~~The~~ A magnetic recording medium as claimed in claim 1, comprising:

a substrate;

a magnetic layer, including a CoCr-based alloy and nonmagnetic elements other than Cr, and having a multi-layer structure and disposed above said substrate,

said multi-layer structure having a first magnetic layer disposed above said substrate and at least one second magnetic layer disposed directly on said first magnetic layer on an opposite side from said substrate;

a first underlayer including a Cr-based alloy and disposed on said substrate; and

a second underlayer including a Cr-based alloy and disposed between said first underlayer and said first magnetic layer, said second underlayer including at least one element selected from a group consisting of Mo, W, V and Ta;

said first magnetic layer having a Cr-content larger than that of said second magnetic layer,

said first magnetic layer having a larger sum total content of nonmagnetic elements which are other than Cr and which nonmagnetic elements have a larger atomic radius than Co compared to said second magnetic layer,

said second underlayer having a larger sum total content of elements, other than Cr, than said first underlayer;

wherein said first and second magnetic layers include approximately 8 to 15 at% of Pt, and approximately 1 to 6 at% of B.

4. (Canceled)

5. (Canceled)

6. (Canceled)

7. (Currently Amended) ~~The A magnetic recording medium as claimed in claim 1 comprising a plurality of second magnetic layers,~~ comprising:

a substrate;

a magnetic layer, including a CoCr-based alloy and nonmagnetic elements other than Cr, and having a multi-layer structure and disposed above said substrate,

said multi-layer structure having a first magnetic layer disposed above said substrate and a plurality of second magnetic layers including one second magnetic layer disposed directly on said first magnetic layer on an opposite side from said substrate;

a first underlayer including a Cr-based alloy and disposed on said substrate; and

a second underlayer including a Cr-based alloy and disposed between said first underlayer and said first magnetic layer, said second underlayer including at least one element selected from a group consisting of Mo, W, V and Ta,

said second underlayer having a larger sum total content of elements, other than Cr, than said first underlayer;

wherein:

said first magnetic layer has a Cr-content larger than that of a lowermost one of said second magnetic layers disposed closest to said first magnetic layer,

said first magnetic layer has a larger sum total content of nonmagnetic elements which are other than Cr and which nonmagnetic elements have a larger atomic radius than Co compared to the lowermost one of said second magnetic layers; and

between two mutually adjacent second magnetic layers, the Cr-content and the sum total content of the nonmagnetic elements are respectively larger for a second magnetic layer disposed closer to said first magnetic layer.

8. (Currently Amended) A method of producing a magnetic recording medium which includes a magnetic layer including a CoCr-based alloy and nonmagnetic elements other than Cr and having a multi-layer structure, comprising the steps of:

- (a) forming a first magnetic layer on a base layer;
- (b) forming at least one second magnetic layer directly on the first magnetic layer,

said steps (a) and (b) being carried out so that a Cr-content of the first magnetic layer is larger than that of the second magnetic layer, and a sum total content of nonmagnetic elements which are other than Cr and which nonmagnetic elements have a larger atomic radius than Co in the first magnetic layer is larger compared to that of the second magnetic layer;

- (c) forming a first underlayer made of a Cr-based alloy on a substrate; and
- (d) forming a second underlayer made of a Cr-based alloy between the first underlayer and the first magnetic layer, said second underlayer including at least one element selected from a group consisting of Mo, W, V and Ta; and

- (e) forming, as the base layer, an intermediate layer made of a Co-based alloy between the second underlayer and the first magnetic layer,

said steps (c) and (d) being carried out so that the second underlayer has a larger sum total content of elements, other than Cr, than the first underlayer.

9. (Currently Amended) The method of producing the magnetic recording medium as claimed in claim 8, wherein said steps (a) and (b) form the first and second magnetic layers to include at least one nonmagnetic element selected from a group consisting of Pt, Ta, W and B.

10. (Currently Amended) ~~The~~ A method of producing ~~the~~ a magnetic recording medium ~~as claimed in claim 8, which includes a magnetic layer including a CoCr-based alloy and nonmagnetic elements other than Cr and having a multi-layer structure,~~ comprising the steps of:

(a) forming a first magnetic layer on a base layer;

(b) forming at least one second magnetic layer directly on the first magnetic layer,

said steps (a) and (b) being carried out so that a Cr-content of the first magnetic layer is larger than that of the second magnetic layer, and a sum total content of nonmagnetic elements which are other than Cr and which nonmagnetic elements have a larger atomic radius than Co in the first magnetic layer is larger compared to that of the second magnetic layer;

(c) forming a first underlayer made of a Cr-based alloy on a substrate;

(d) forming a second underlayer made of a Cr-based alloy between the first underlayer and the first magnetic layer, said second underlayer including at least one element selected from a group consisting of Mo, W, V and Ta;

said steps (c) and (d) being carried out so that the second underlayer has a larger sum total content of elements, other than Cr, than the first underlayer;

wherein said steps (a) and (b) form the first and second magnetic layers to include approximately 8 to 15 at% of Pt, and approximately 1 to 6 at% of B.

11. (Canceled)

12. (Canceled)

12. (Canceled)

14. (Canceled)

15. (Currently Amended) ~~The~~ A method of producing ~~the~~ a magnetic recording medium ~~as claimed in claim 8, which includes a magnetic layer including a CoCr-based alloy and nonmagnetic elements other than Cr and having a multi-layer structure,~~ comprising the steps of:

(a) forming a first magnetic layer on a base layer;

(b) forming at least one second magnetic layer directly on the first magnetic layer,

said steps (a) and (b) being carried out so that a Cr-content of the first magnetic layer is larger than that of the second magnetic layer, and a sum total content of nonmagnetic elements which are other than Cr and which nonmagnetic elements have a larger atomic

radius than Co in the first magnetic layer is larger compared to that of the second magnetic layer;

(c) forming a first underlayer made of a Cr-based alloy on a substrate; and

(d) forming a second underlayer made of a Cr-based alloy between the first underlayer and the first magnetic layer, said second underlayer including at least one element selected from a group consisting of Mo, W, V and Ta;

said steps (c) and (d) being carried out so that the second underlayer has a larger sum total content of elements, other than Cr, than the first underlayer;

wherein:

said step (b) forms a plurality of second magnetic layers;

said steps (a) and (b) are carried out so that the Cr-content of the first magnetic layer is larger than that of a lowermost one of the second magnetic layers disposed closest to the first magnetic layer, the sum total content of nonmagnetic elements which are other than Cr and have the larger atomic radius than Co of the first magnetic layer is larger than the lowermost one of the second magnetic layers, and between two mutually adjacent second magnetic layers the Cr-content and the sum total content of the nonmagnetic elements are respectively larger for a second magnetic layer disposed closest to the first magnetic layer.



16. (Currently Amended) A magnetic storage apparatus comprising:

a head; and

at least one magnetic recording medium provided with a substrate, a magnetic layer made of a CoCr-based alloy, having a multi-layer structure and disposed above the substrate, said multi-layer structure having a first magnetic layer disposed above said substrate and at least one second magnetic layer disposed directly on said first magnetic layer on an opposite side from said substrate, a first underlayer including a Cr-based alloy and disposed on said substrate, and a second underlayer including a Cr-based alloy and disposed between said first underlayer and said magnetic layer, and an intermediate layer made of a Co-based alloy and disposed between said second underlayer and said first magnetic layer, said second underlayer including at least one element selected from a group consisting of Mo, W, V and Ta;

said first magnetic layer having a Cr-content larger than that of said second magnetic layer, and having a larger sum total content of nonmagnetic elements which are other than Cr and have a larger atomic radius than Co than said second magnetic layer,

said second underlayer having a larger sum total content of ~~elements, other than~~ Cr, than said first underlayer.

17. (Canceled)

18. (Canceled)